1991 D.A.T.E. POGRAM REPORT

Demonstration of Agricultural Technology and Economics

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1991 - 92 D.A.T.E. PROGRAM

The D.A.T.E. (Demonstration of Agricultural Technology and Economics) program provides for British Columbia Ministry of Agriculture, Fisheries and Food staff supervised projects.

Twenty-eight new and ongoing projects were carried out and reported on during the 1991 - 92 fiscal year. Included below are highlights from a few of the areas studied.

- A Ginseng technology fact finding mission to Japan, Korea, Taiwan and Hong Kong provided excellent information on all aspects of Ginseng production, marketing and use. The contacts made will be of ongoing value to the development of B.C.'s ginseng industry.

- A retail marketing and post harvest handling seminar was held for growers, wholesalers and retailers of B.C. grown Christmas trees. Video tapes of the seminar proceedings were made which will be used at grower meetings throughout the province.

- Integrated Pest Management was expanded on Vancouver Island to include carrot and potato producers through the D.A.T.E. program. As pressure continues on the agriculture community to be more responsible in their use of pesticides, these types of programs become even more essential.

- Tomato spotted wilt virus is a serious disease of greenhouse crops. A project was carried out to identify reservoir weed hosts of the virus and to determine sites of viruliferous thrips and weed reservoirs in British Columbia.

- A project was carried out to investigate the feasibility of innoculative releases of a parasitic wasp for control of the green peach aphid in commercial potatoes participating in an Integrated Pest Management programme.

The D.A.T.E. Program Committee would like to acknowledge the co-operation of the project supervisors in implementing the 1991 - 92 D.A.T.E. Program. Program results are very valuable to the agricultural industry.

TERMS OF REFERENCE

D.A.T.E. funds may be used for:

1. Evaluating and demonstrating known technological advances for enhancing the production, processing and marketing of agricultural products.

2. Supporting adaptive research projects aimed at solving priority problems confronting British Columbia agriculture.

3. Investigating production, processing and marketing systems to identify or substantiate the need for new technology.

4. Supporting mission-oriented trips with the objectives of: investigating innovative production, processing and marketing techniques for import or ultimate adoption in this province, and/or investigating export opportunities for British Columbia agriculture and fisheries technology.

5. Importing expertise to assist in introducing new technology or to advise on critical problem situations.

PHEROMONE-BASED MATING DISRUPTION FOR CONTROL OF CODLING MOTH

Pheromone dispenser hanging in an apple tree

Project Number: 292

Supervision: Hugh Philip, Entomologist, Kelowna

Project Staff: Ken White, Nicole Verpaelst

Cooperators: Dr. Gary Judd and Mr. Mark Gardiner, Entomologists, Agriculture Canada Research Station, Summerland

Branch: Crop Protection

Funding:

1990-91		1991-92	
D.A.T.E.	-$6,500	D.A.T.E.	-$6,500
S.O.O.P.A.	-$5,000	S.O.O.P.A.	-$5,000
Agriculture Canada	-$2,500	Agriculture Canada	-$2,500

Objectives: To evaluate and demonstrate the effectiveness of a pheromone-based mating disruption treatment, for control of codling moth in organic apple and pear orchards in the Okanagan and Similkameen Valleys.

Summary: Codling moth is the most important insect pest of pome fruits in the interior of British Columbia, and a major constraint to successful production of organic apples and pears.

Female codling moths release sex pheromones to attract male mates. Synthetic pheromones have long been used in traps to monitor seasonal flight activity, and time insecticidal sprays against codling moth. However, research over the past five years has shown that pheromones can be used to control codling moth. When synthetic pheromones are released into the air in large enough quantities, male codling moths are unable to find females, hence normal mating is disrupted, fewer viable eggs are laid, and less crop damage ensues. This 2-year study was undertaken to demonstrate the efficiency of mating disruption as an alternative to using insecticides in commercial orchards in the interior of B.C. Results obtained in 1990 revealed that, in well managed orchards, mating disruption provided a level of control similar to insecticides. The 1991 study was designed to evaluate mating disruption over a wider geographic range using a greater number of orchards.

In 1991, twenty-two apple and twelve pear blocks were treated with pheromone, three apple and two pear blocks were treated with insecticides and one apple block was left untreated. Each orchard was monitored with 1 and 10 mg pheromone-baited traps throughout the season to assess male disorientation to traps (considered to be one measure that disruption is occurring) and to determine if the traps could still be used to predict damage. Each orchard was sampled for codling moth damage at harvest. In four pheromone-treated and one untreated apple orchard, all trees were banded with 10 cm cardboard strips to trap overwintering larvae. Banding data from these orchards in 1991 was compared to 1990 data to provide a measure of the change in codling moth population density after pheromone treatment.

In 1991, damage in pheromone-treated apple blocks ranged from 0.01 to 7.3%, with 80% of the apple blocks having less than 1% damage at harvest. Damage in pheromone-treated pear blocks ranged from 0.08 to 8.4% and 75% of the pear blocks had less than 2% damage.

Three insecticide-treated apple blocks had 0.03, 0.06 and 0.22% damage, respectively, while two insecticide-treated pear blocks had 2.6 and 4.2% damage. The untreated apple orchard had 56.9% damage. There was a significant correlation ($r=0.78$) between damage at harvest and the number of first-brood males caught in 10 mg pheromone-baited traps, suggesting these traps may be useful in predicting potential problems and recommending remedial measures in disruption blocks if needed.

Four organic apple blocks treated with pheromone in 1990 and 1991, had significantly ($P < 0.05$) less damage, and fewer overwintering larvae in 1991. The median number of larvae caught in 1990 was 1/tree, whereas in 1991 it was 0.05/tree. The untreated orchard had 7.1 larvae/tree.

In this study mating disruption provided season-long control of codling moth at damage levels comparable to insecticides. Given the reductions in environmental contamination, producer exposure to toxic materials and pesticide residues in fruit obtained by applying the pheromone disruption technology, pheromone-based mating disruption should be considered as a viable alternative to conventional insecticide sprays under prescribed conditions in apple and pear orchards.

GINSENG REPLANT STUDY

An overview of the First Year Ginseng Replant Plot

Project Number: 296

Supervision: Al Oliver, Provincial Ginseng Specialist, Kamloops

Cooperators: The Associate Ginseng Growers of B.C.
B & B Ginseng, Vernon, B.C.
Pak Shade Cloth, R. Dunsdon, Kamloops
Chicopee Shade Cloth, K. Keifer Wausau, WI

Funding:

D.A.T.E.	1991-92	$500
B & B Ginseng	1991-92	$700
Chicopee	1991-92	$700
T.A.G.G.	1991-92	$500

Objective: To test the generally accepted rule that ginseng cannot be grown where ginseng has previously been grown as valid in British Columbia.

Summary: The fall of 1991 saw the second planting of the three proposed in this ginseng replant project.

The seed sown in the fall of 1990 germinated fairly well, although it was less dense than a similar planting nearby on land not used for ginseng before.

The germination and first year of growth has not traditionally been the problem but rather subsequent years. It will be interesting to compare future (91 and 92) seedings with the 1990 planting.

As in 1990, only two soil treatments were used. It was decided to drop the possible use of Methyl Bromide for various reasons. The two products used were Basamid and Telone C-17, at label rates.

The labour for this project was supplied by B & B Ginseng. B & B Ginseng will own all the product and materials when the project is complete. This will be at the end of the seventh growing year assuming that enough plants live to that age. The shade cloth, for the spring of 1992 is being supplied by Panax Ltd. (Kelly Kieffer) of Wausau, Wisconsin who sells the "Chicopee" cloth. The Associated Ginseng Growers of B.C., are again donating $500 towards this project.

The plants in the row treated with Telone C-17, were the healthiest and in greatest abundance although not a great difference was observed. Plant counts have been taken inside specifically marked areas and these will continue for the duration of the project. More detailed observations will be made as plant growth progresses and comparisons can be made. Normal crop protection programs are in place for watering and pest control, and are being carried out by B & B Ginseng.

DEFINING THE ROLE OF PARASITIC WASPS IN CONTROL OF GREEN PEACH APHID IN IPM POTATO FIELDS

Dr. Henry Gerber and Debbie Henderson releasing parasitic wasps for aphid control on potatoes.

Project Number: 298

Supervision: Dr. Henry Gerber, Entomologist
Cloverdale

Cooperator: E.S. Cropconsult Ltd.

Branch: Crop Protection

Funding:

D.A.T.E.	1991-92	$3,500
	1992-93	$3,570
E.S. Cropconsult	1991-92	$3,550
	1992-93	$3,530

Objective: To investigate the feasibility of innoculative releases of the parasitic wasp Aphidius matricariae for control of the green peach aphid Myzus persicae in commercial potatoes participating in an IPM programme.

Summary: In "normal" aphid pressure years, IPM fields usually are not sprayed for aphids. In "high" aphid pressure years such as 1989, many fields did require aphid sprays but there were some that did not.

It was noted that the parasitic wasp Aphidius matricariae was present in these fields and this lead to the speculation that the establishment of a population of the parasitic wasp early in the growing season may be useful in moderating the aphid population later. There are a number of reasons it is desirable to eliminate aphid sprays in IPM fields. While aphid populations rebound after an insecticide spray, those of beneficial insects which control them, do not. The consequence of a single aphid spray therefore, can be regular aphid sprays till the end of the season. Aphids are becoming resistant to the chemicals used to control them and resistance can be best managed by restricting the use of those chemicals. In addition, pesticides are not being developed and registered as they once were and registrations are being lost. In the event that effective chemical controls are no longer available, alternatives are needed.

The behaviour of this parasitic wasp to seek out individual hosts even at low population levels, made it a good prospect for an innoculative release, (i.e., release of a small number of wasps) early in the season when aphid numbers are low. This would allow the wasp population to build up within a field and be present during peak aphid flight in August. An innoculative release would be an economically feasible option which could save costly sprays later.

In 1991 Aphidius matricariae obtained commercially were released on July 15, in 5 IPM fields in which aphids were detected during regular sampling earlier that week. To compare these with fields in which no wasps were released, five untreated fields were chosen for study, (i.e., no wasps released). These fields were similar to the treated fields in acreage, variety and stage of development. In the treated fields (wasps released), approximately 40 wasps per acre were released along edges where aphids were found. The release sites were marked and subsequent sampling included those areas.

Weekly aphid counts were made from the outer edges and inner rows of all fields. Lower leaf triplets were collected and the healthy and parasitized aphids on these were recorded.

There was no significant difference in aphid number per triplet between treated and untreated fields. None of these fields sustained aphid numbers that required a spray. The number of parasitized aphids per triplet reached a higher level in treated fields but variation between fields was high. In most fields, both treated and untreated, aphid numbers declined at the end of the season and there was a trend to higher number of parasitized aphids than healthy aphids in the final samples before harvest. The 1991 season was unusual, in that virtually all fields had higher than usual populations of Aphidius. It is very possible that the presence of these high natural populations obscured the differences we expected to see between treated and untreated fields. The second year of the study will help to clarify this.

RECOVERY AND RECIRCULATION OF DRAINAGE WATER FROM GREENHOUSE VEGETABLE CROPS

Recirculation in cucumbers - late stages of growth

Project Number: 299

Supervision: David Flood, Greenhouse Technologist, Abbotsford
Jim Portree, Provincial Greenhouse Vegetable Specialist, Abbotsford

Cooperators: Brian Mauza, Western Greenhouse Grower's Cooperative Association
Leslie MacDonald, Plant Pathologist, Cloverdale, B.C.
Diane Scott, Plant Disease Diagnostician, Cloverdale, B.C.

Funding:

D.A.T.E.	1990-91	-	$10,590
D.A.T.E.	1991-92	-	$600

Objectives:

1. To assess recirculation technology and its integration into current production methods for greenhouse crops.

2. To demonstrate the feasibility of waste fertilizer recirculation and its influence on production and production costs.

3. To develop management guidelines for utilizing recirculation technology without compromising current production standards.

Summary: Growers are increasingly concerned about ground water pollution and the possibility of stricter controls on farm effluents. New recirculating technologies can significantly reduce amounts of fertilizers and other effluents draining from the greenhouse. Cucumber production in sawdust bags has been a highly productive and cost effective cropping method in B.C.

In the second year of a two year study on nutrient recirculation in sawdust grown vegetable crops, a crop of sawdust grown Long English cucumbers cv.Mustang was raised to evaluate the potential of recycling waste water for run-off control and fertilizer conservation. Yields of marketable fruit were compared against an identical group of standard, drain to waste sawdust grown plants. Water and fertilizer use was monitored and regular tissue and nutrient solution analyses were performed.

Cucumber plants (cv.Mustang) were seeded into rock wool cubes on January 2, 1991, and planted into the bags on January 18 at a plant density of 1.2 plants/M2. The first fruit was harvested on February 28 and cropping continued until July 26.

Yield: No significant differences in yield or grade % occurred between treatments.

Nutrition: Some variations in solution analysis did occur during the trial, but were not substantially reflected in tissue levels.

Water Use: The recirculated crop used 35% less water than the non-recirculated crop.

Fertilizer Use: The recirculated crop used 38% less fertilizer that the non-recirculated crop.

Pathogens: No pathogens were isolated from either crop. No plants were lost due to root or crown disease.

Innoculation of the crops with Pythium did result in the spread of the organism, but no plant losses occurred.

It appears that sawdust can provide an acceptable medium for growing cucumbers in a recirculating system. The nutrient status in a recirculating solution replenished solely on the basis of E.C. without periodic dumping would seem to be adequate, providing the replenishing fertilizer formula is in balance with the needs of the plant. Minor fluctuations of the relative amount of fertilizer elements does not appear to seriously affect cucumber tissue levels in the short or long term, or the yield of marketable fruit.

The fertilizer savings realized by recycling, amortized over the the life of a recirculating system installation could provide a substantial payback while eliminating pollution problems from greenhouse run-off.

The disease potential in recirculating systems will continue to be a topic of concern and further study. Although no incidental root disease was detected in this particular trial, sanitizing systems for sterilizing the return water may provide added insurance against the spread of water borne pathogens and might be particularly useful in Pythium susceptible crops such as cucumbers.

With the equipment made possible through D.A.T.E. funding, work on waste recirculating will be continuing in 1992-93 with greenhouse peppers raised on rock wool slabs. Recirculation will once again be compared to drain to waste irrigation to evaluate yields, nutrition and disease management.

SUB-IRRIGATION SYSTEMS FOR PRODUCTION OF CONTAINERIZED ORNAMENTAL PLANTS

Project Number: 300

Supervision: Carol Barnett, Nursery Industry Specialist, Abbotsford

Project Coordinator: Peter Leidenfrost, Nursery Technician, Abbotsford

Cooperators: Russ Merz, Soils and Engineering Branch
Valley Brook Gardens Ltd.
Hybrid Nurseries Ltd.

Branch: Agriculture Division, South Coastal Region

Funding:

D.A.T.E.	1990-91	$10,950
D.A.T.E.	1991-92	$ 2,000

Objectives:

1). To assess a sandbed and an ebb and flood system, which feature sub-irrigation and water recycling, under B.C. weather conditions for the production of containerized ornamental plants.

2). To provide B.C. growers with management information on this system that will make this a reasonable and environmentally sound alternative to the present production system.

Summary: The sub-irrigation systems were constructed at Valleybrook Gardens Ltd. Peardonville Road, Abbotsford location. Each system measured 8 ft. by 40 ft., and both were contained within a 20 ft. by 48 ft. polyhouse.

Sandbed:

The perimeter of the sandbed was lined with 2" x 6" pressure treated wood. Black plastic lined the bottom of the bed. A 2" drainage pipe was placed down the centre (long dimension) of the bed in a slight depression.

About 3" of sand covered the drainage pipe and liner which was secured on the pressure treated wood. The sand was levelled using water. The drainage pipe was connected outside of the pipe to a small basin. A water float in the basin assured a constant water table in the sand bed.

Ebb and Flood:

The bed perimeter was lined with 2" x 6" pressure treated lumber; the bottom was covered with black plastic and tacked to the sides. Pea gravel was used to fill the bed, the surface of which was level. The base of the bed was sloped toward the reservoir end (1.25%). Screened drain pipes drained the irrigation water into a 2273 litre reservoir. A pump pushed the water via a 2" pipe up the long side of the bed to a header pipe. When the pump was running, the gravel and base of the pots (1" depth) were flooded. The pump ran for 15 minutes via a time clock. Tap water was used to top up the reservoir. A float valve in the reservoir served as a shut off valve.

Plants, Rhododendron 'Cunningham's White', Arctostaphylos uva-ursi 'Vancouver Jade' and Rhododendron 'Sherwood Cerise' were used as test plants. The plants were potted in the standard manner in #1 gallon pots with mesh bottoms in May, 1991.

Controlled release fertilizer application rate and method varied:

Treatment	Method	Rate
Control	Incorporated	6.0 Kg/m3
	Topdress	10.0 g/pot
Sandbed/ Ebb & Flood	Incorporated	1.2 Kg/m3
		3.0 Kg/m3
		2.0 g/pot
		5.0 g/pot

* The fertilizer was inserted 3-4 inches below the surface of the growing medium.

All treatments were replicated (blocked) 10 times down the length (40 feet) of the sub-irrigation beds. There were three subsamples per treatment combination. Each block was surrounded by guard rows.

Plants were grown for a full season and rated for size and overall quality in October. The plastic cover remained on the polyhouse the entire season. Open side vents ensured good air circulation.

The control treatment was grown under overhead irrigation as required at the Agriculture and Food Centre. Plants were irrigated continuously in the sandbed, and as required for the control and ebb and flood treatments. However, frequency did not exceed once per day.

Rhododendron 'Cunningham's White'

Results from the rating indicated that plants in the sub-irrigation beds were superior to the control plants. Higher rates of fertilizer improved ratings in all cases. The 5 g/pot dibbled treatment, resulted in the best plants for both of the sub-irrigation systems.

Rhododendron (Azalea) 'Sherwood Cerise'

Plants receiving higher rates of incorporated fertilizer grew better than plants receiving the lower rate for both sub-irrigation systems. However, the plant rating at the higher rate for the sandbed was not significantly different than the average control plant rating.

Arctostaphylos uva-ursi 'Vancouver Jade'

The results are similar to those described for the Rhododendron cultivars. Both sub-irrigation systems produced superior plants than the control at the higher fertilizer rate.

Analysis of water samples taken at two week intervals from the ebb and flood reservoir tank indicate that only small amounts of dissolved nutrients accumulated in the recycled water (data not shown).

Three types of herbaceous perennials, aster, summer phlox and heuchera, were grown on the sub-irrigation system in three pot types placed in plastic flats with mesh bottoms. The 3 1/2" standard and rose pots wetted and produced good quality plants in both systems. However, the fibre pots did not wet well on the sandbed and had to be removed from the trays and placed directly into the sand.

Rooting into the sandbed is a major problem to prevent. Trials with several products sprayed onto the sand are promising. Further study is required in 1992.

MARKET POSITIONING OF VEGETABLES GROWN UNDER INTEGRATED PEST MANAGEMENT (IPM) TECHNIQUES

Focus group session on Integrated Pest Management

Project Number:	301 Phase 2	
Supervision:	Jim Alcock, Sector Manager, Fruits and Vegetables Marney James, Manager, Horticulture Programs	
Cooperators:	B.C. Coast Vegetable Cooperative E.S. Cropconsult Ltd. Pro Tect Crop Consulting Services Okanagan Valley Tree Fruit Authority Agriculture Canada, Research Branch Campbell Goodell Consultants	
Funding:	D.A.T.E. 1991-92 South Coastal Region OVTFA	$4,000. $1,000. $ 500.

Objectives: Two focus groups, comprising of primary household purchasers of produce items, were conducted to:

1. Evaluate the terminology and ways of communicating the concept of IPM to consumers purchasing B.C. produce.

2. Consider the potential of terminology and communication methods to effectively and appropriately differentiate B.C. produce grown with IPM technology from that of other produce grown in B.C. and other areas of supply.

3. Make recommendations on terminology and methods to effectively position B.C. produce, grown with IPM technology as highly desirable from the perception of buyers and consumers.

4. Evaluate if there are positive or negative associations of certain terminology being evaluated with specific produce items.

5. Seek responses from the target groups on how they would react to various ways of identifying produce being marketed as grown with IPM techniques.

Summary: The major findings that emerged from these discussion sessions are as follows:

1. There is strong loyalty to B.C. grown produce.

2. Consumer's concerns about the IPM program centred around regulations and the provision of minimum standards through some form of government endorsement and control.

3. There is an interest and a need for more information about the growing techniques particular to B.C. growers.

4. Several words and phrases were received positively either because they were felt to be good descriptors of the program or because they provided positive feelings and/or connotations. Others were viewed negatively.

Recommendations were as follows:

1. All communications materials and logos should identify that the IPM produce is grown in B.C.

2. Clearly state in all communication materials that the government is endorsing the program and providing standards which participating growers must follow.

3. The selected terminology should be different enough that consumers do not confuse produce grown using IPM techniques with organically grown produce. Include words such as GROWN, RESPONSIBLE, CARE, QUALITY, and BALANCE to increase awareness and the appeal of produce grown using IPM techniques. The phrase GROWN IN BALANCE WITH NATURE is a good candidate.

4. If the IPM idiom is used, substitute more positive words such as IMPROVED PRODUCTION METHODS instead of Integrated Pest Management, which was felt to be unappealing and not easily understood.

5. The logo's graphic should include B.C. identifiers such as mountains and/or native fauna. The "B.C." initials must be a major focus of the logo.

6. Develop a full communications program to launch the terminology and logo for the IPM program.

HARDY KIWIFRUIT EVALUATION

The most promising variety currently under test at Sidney.

Project Number: 302

Supervision: Brent Warner, New Crop Specialist, Sidney
Ronny Quay, Horticulture Technician, Sidney

Cooperator: Agriculture Canada, Plant Quarantine Station, Sidney

Division: Agriculture

Funding:

D.A.T.E.	1990-91	$2,000
D.A.T.E.	1991-92	$2,000

Objective: To evaluate the selections of Actinidia arguta for commercial cultivation.

Summary: The four varieties selected for further evaluation in 1990 have been re-propagated and established in a planting at the quarantine station. These selections are Ananasnaya, Issai, Noel and Red Prince.

No fruit was harvested in 1991, due to the young age of the vines, but this planting will be evaluated over the next 3 to 5 years as part of ongoing work with kiwifruit cultivars and management techniques.

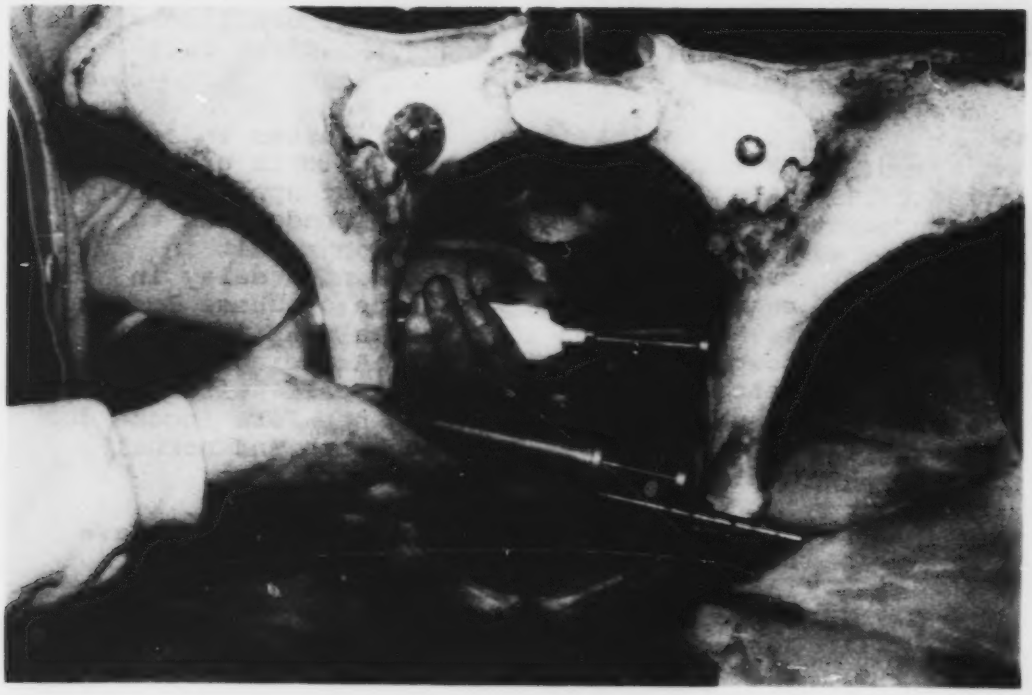
The three major areas of concern still to be addressed are:

1) the difficulty in assessing fruit ripeness.
2) the difficulty in harvesting without damaging the fruit.
3) the unevenness of fruit ripening on individual branches.

All of these areas must be addressed before this can become a viable commercial crop.

As new varieties become available, they will be included in this evaluation project.

FIELD TESTING OF DYSTOCIA PREDICTION EQUATIONS IN FIRST CALF HEIFERS



Pelvimeter Used to Measure Pelvic Area

Project Number: 305

Supervision: Bob France, Beef Industry Specialist, Vernon
Greg Tegart, District Agrologist, Vernon
Graham Strachan, Senior Agrologist, Kamloops

Cooperators: Chutter Ranch, Merritt
Norm Peters, Kamloops
Turtle Valley Co-op, Chase
John Schalles, Ashcroft
Coldstream Ranch, Vernon
Douglas Lake Ranch, Douglas Lake
Devick Ranch, Kamloops
Uli Steiner, Kamloops
Rob White, Kamloops
Michael Ruechel, Vernon

Branch: Agriculture Program - Southern Interior Region

Funding:

D.A.T.E.	1990-91	$2,000
D.A.T.E.	1991-92	$2,500

Objective: To field test prediction equations that were developed to predict calving problems (dystocia) in first calf heifers. A joint project with Alberta Agriculture involving a total of 80 herds and 4,532 first calf heifers.

Method: It is estimated that calf losses in British Columbia due to dystocia problems, account for a lost income of approximately $1.45 million annually. In addition to direct losses, dystocia can result in reduced conception rates and a delay in rebreeding. The incidence of these losses is more common in first calf heifers as compared to older cows. Reducing dystocia related problems in first calf heifers would result in an increase in net farm income due to fewer calves lost at birth and normal heifer fertility following calving.

Several dystocia prediction equations have been developed by various researchers, including one by Dr. Laura Rutter, reproductive physiologist with Alberta Agriculture. Ten herds in B.C. involving over 2000 first calf heifers, participated in the trial.

In 1990, measurements were taken on the heifers which included pelvic width and height, hip height, shoulder height, body condition score, weight, birth date and the measurement date. This data was then used in the models to produce a list of those heifers that were expected to have calving problems , when they calved for the first time in 1991. However, since this was a field test of the accuracy of the models to predict calving problems, the lists generated by the models were not provided to the cooperators. Each producer was asked to keep accurate calving records for all first calf heifers and to record any calving problems experienced. If the models are accurate in their predictions, the records kept by the producers would closely match those generated by the models.

To date, the results of two models have been completed. The first method made a calculation to determine pelvic area.

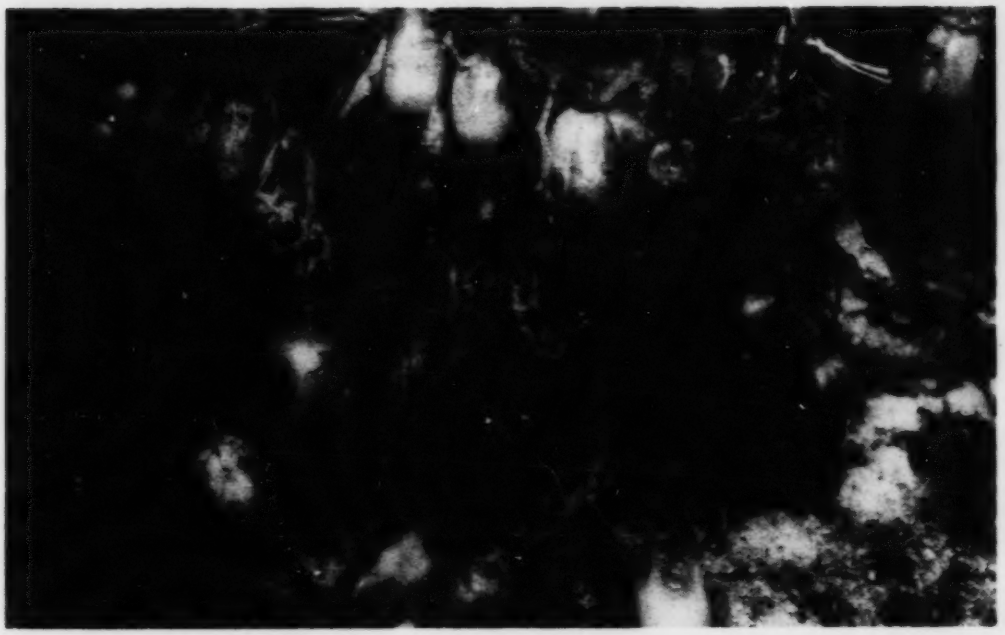
This area was then divided by a constant value to produce a 'deliverable calf birth weight' for each heifer.

The second method was more complicated and attempted to cull those heifers with low pelvic area per 100 lbs. of body weight.

Summary: Using the data from 80 herds in Alberta and B.C., it was determined that culling heifers based on either of the two methods tested to date, would have only marginally reduced difficult birth rate in first calf heifers. The cost effectiveness of using either method was also considered questionable.

However, the data collected in this trial will be useful in the future to evaluate the accuracy of further models as they are developed. Methods for predicting dystocia in first calf heifers should be greater than 85% accurate to ensure practical application.

A SURVEY OF THRIPS AND WEED HOSTS FOR TOMATO SPOTTED WILT VIRUS IN BRITISH COLUMBIA



Severe tomato spotted wilt virus infection on outdoor Roma tomatoes.

Project Number: 311

Supervision: Leslie MacDonald, Plant Pathologist/A, Cloverdale
Dr. Bob Costello, Entomologist, Cloverdale

Project Staff: Iris Bitterlich, contractor
Gerda Bowler contractor

Cooperators: Dr. Peter Ellis and Dr. Don MacKenzie
Agriculture Canada Research Station, Vancouver
Roy Cranston, Weed Specialist, Cloverdale
Diane Scott Hsiung, Diagnostician/A, Cloverdale

Branch: Crop Protection

Funding:

D.A.T.E.	1991-92	$6,000
Western Greenhouse Growers Co-op		$3,600
United Flower Growers Co-op Assoc.		$3,600

Objective:

Tomato spotted wilt virus (TSWV) was first detected in British Columbia over 20 years ago and has been on the increase ever since. Losses to greenhouse crops to date are estimated to exceed $3 million. This work was done to identify reservoir weed hosts of TSWV and to determine sites of viruliferous thrips and weed reservoirs in British Columbia. The results will be used to determine better control measures for TSWV in greenhouse crops. Losses from TSWV have been restricted to greenhouse crops so far, but field vegetables are susceptible to infection. Survey results will provide information on how TSWV was established near these crops.

Summary:

Over 1800 samples, consisting of 176 plant species from 38 commercial greenhouses, were collected and analyzed by serology tests. Ninety-four samples of thrips were collected and tested from 23 locations.

TSWV was detected at 25 of the 38 commercial sites surveyed in 1991. Infected crops and weeds were found in the Fraser Valley, on Vancouver Island and in Kelowna. Fifteen of the sites where TSWV was detected during the survey had previously had TSWV infected crops and in 13 of these locations, TSWV was present in weeds at the site. The remaining 10 locations had no history of TSWV although they had not been tested prior to 1991. Of the 13 sites where TSWV was not detected, seven of these did have infected crops prior to the survey and six had not been previously tested.

TSWV was detected in weeds at 20 of the 38 locations. Chickweed was the most commonly infected weed with 14 of 34 sites having infected plants. TSWV was detected in clover, bull thistle, black medick and cleavers growing outside the greenhouse. Inside the greenhouse, annual sowthistle, bitter cress, Canada thistle, sheep sorrel, shepherd's purse and wood sorrel were infected with TSWV.

None of the infected weeds showed any symptoms to suggest they were infected with TSWV. Seven of these weeds overwinter every year and three more would survive most winters in this region.

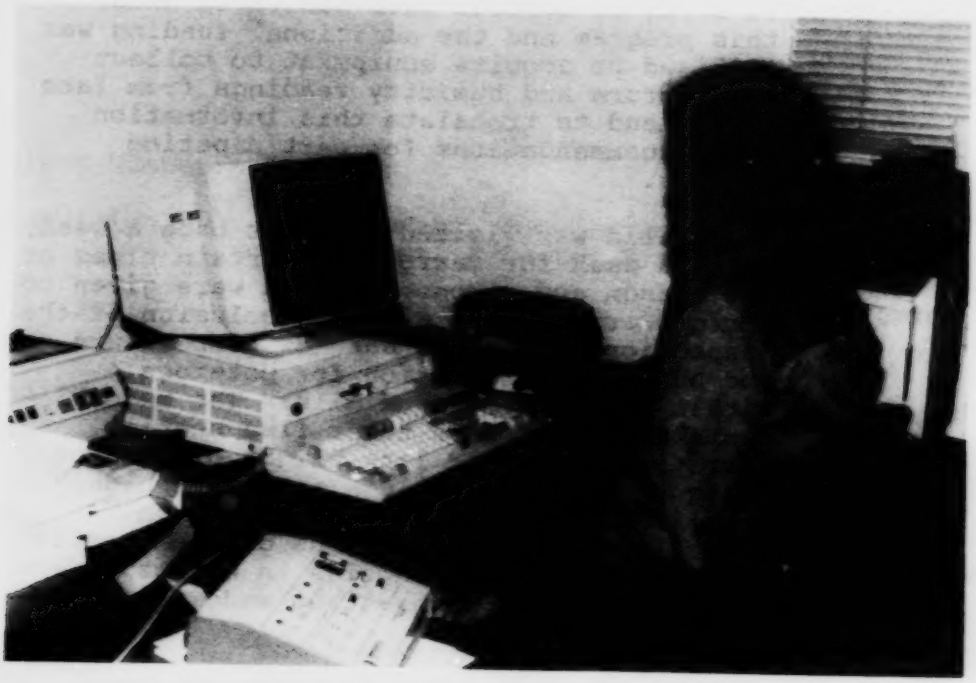
Impatiens was the most commonly infected crop. TSWV was detected as seven of the 18 greenhouses where impatiens were grown. Tomato was infected at five of nine sites, and three of seven pepper greenhouses had TSWV. Brachycome was infected at two sites. This project's supervisor had her backyard tomato crop destroyed by TSWV that was likely introduced on infected impatiens from a local garden center. Both the impatiens and lettuce strain of TSWV was found on weeds and crops. The impatiens strain was detected at 19 sites, whereas the lettuce strain was detected at 15 sites. Both strains can be present at the same site and even in the same plant.

Thirteen percent of the thrips tested for TSWV were carrying the virus. All of these were western flower thrips and all were collected from inside the greenhouse.

These results show that TSWV is established in perennial weeds in B.C., and that it is still present at over half of the locations which had previous infections. The floriculture, greenhouse vegetable and field vegetable industries are valued at over $207 million and many of these crops are susceptible to TSWV. Early detection and good thrips control are essential to the management of this disease. It is imperative that growers have access to a fast and reliable diagnosis. Monitoring will continue through submissions to the Plant Diagnostic Lab. The B.C. Plant Protection Advisory Council TSWV Committee remains active.

A full report titled "The Prevalence of Tomato Spotted Wilt Virus in Weeds and Crops in Southwestern British Columbia" is available.

INTEGRATED PEST MANAGEMENT



Brent Warner downloading data chips for potato pest management program.

Project Number: 312

Supervision: Brent Warner, New Crop Specialist, Sidney
Ronny Quay, Horticulture Technician, Sidney
Tania Jones, Contractor

Cooperators: Vantreight Farms, Saanichton, Echo Valley Farms, Parksville
Galey Farms, Victoria
Comox Valley Farm, Courtenay

Division: Agriculture

Funding: D.A.T.E. 1991-92 $2,000

Objective: To expand the existing I.P.M. project on Vancouver Island to allow monitoring of additional crops and to allow for more data collection at participating farms.

Summary: Integrated Pest Management for island carrot and potato producers has become a reality over the last year through this program.

Two hundred and twenty acres of potatoes and 60 acres of carrots were monitored under this program and the additional funding was utilized to acquire equipment to collect temperature and humidity readings from farm fields and to translate this information into recommendations for participating farmers.

Each field was visited at least once a week, twice a week for carrots at certain times of the season and recommendations were given to the growers, either at the conclusion of the inspection or, in the case of temperature and humidity information for potatoes, within 24 hours by facsimile. The major pests monitored were tuber flea beetle, carrot rust fly and late blight of potatoes. Secondary insect problems such as aphids, were also checked for and reported on. Several serious infestations of flea beetle in potato and one of aphids in carrots, were detected and recommendations made for corrective action.

Grower support for this project has been beyond the ability of the project to supply and we are hoping to be able to add an additional half-time person in 1992. The contractor's wages and expenses are all paid for through the fees paid for the service, and the fees set are the same as for growers using similar services in the Fraser Valley.

As pressure continues on the agriculture community to be more responsible in their use of pesticides, these types of programs become even more essential.

CHEMICAL THINNING OF NEW APPLE VARIETIES

Project Number: 314

Supervision: Mike Sanders, Provincial Tree Fruit Specialist, Kelowna, B.C.

Cooperator: Joe Fitzpatrick, B.C. Fruit Growers Test Orchard, Oliver, B.C.

Funding:

D.A.T.E.	1991-92	$2,300
D.A.T.E.	1992-93	$3,000

Objective: To evaluate chemical thinning materials and methods for new apple varieties.

Summary: Full range of testing was not done because project approval was received too late.

The new varieties Gala and Empire were tested in addition to Spartan, an established variety.

Treatments:

- check
- 5ppm NAA at petal fall
- 5ppm NAA when fruit diameter 8-10 mm
- carbaryl (Seven) 100 g/100 L water when fruit diameter 10-15mm
- 5ppm NAA plus carbaryl (Seven) 100 g/100 L water when fruit 10-15 mm
- Spartan only; 350 ppm ethephon (Ethrel) at full bloom

Results:

- Gala - no significant differences
- Empire - The most effective treatments were Seven and Seven plus NAA. The NAA treatments were not different from check.
- Spartan - The most effective treatments were Seven and Seven plus NAA. There were no differences between check, Ethrel, NAA at petal fall and NAA when fruit diameter 8-10 mm.

LEAF ANALYSIS LEVELS FOR NEW APPLE VARIETIES

Project Number: 315

Supervision: Mike Sanders, Provincial Tree Fruit Specialist, Kelowna, B.C.

Cooperator: Dr. Gerry Neilson, Agriculture Canada Research Station, Summerland, B.C.

Funding:

D.A.T.E.	1991-92	$10,000
D.A.T.E.	1992-93	$11,900

Objective: To develop leaf analysis critical levels for new apple varieties to enable optimum production and quality.

Summary: In 1991 leaf samples from three year old and older Gala, Jonagold and Empire trees throughout the Okanagan-Simalkameen were analysed. Sample number totalled 118. The data has been entered into the computer but not analysed at time of writing.

In 1992 the same varieties will be studied and it is likely that several more new varieties will be added.

ADAPTATION OF PEST MANAGEMENT TECHNIQUES FOR HONEYBEE TRACHEAL MITES

Project Number: 316

Supervision: Kerry Clark, Apiculture Specialist, Dawson Creek

Funding: D.A.T.E. 1991-92 $9,750

Objectives: To adapt techniques and develop recommendations for the use of least-toxic chemical controls for the management of tracheal mites in B.C., and to demonstrate the use of these control options.

Summary: In 1988, a parasitic mite new to B.C. was detected in honeybees which had recently been imported from the U.S. Populations of the honeybee tracheal mite, which at high densities reduces winter survival of bee colonies, have been building since then. Last winter, serious winter losses were experienced by a few beekeepers with infested colonies. Since 1984, the Ministry's Apiculture Program, in cooperation with the B.C. Honey Producers Association, has been informing beekeepers about the pest, and taking actions to reduce its spread to unaffected regions of the province. Although the long-term solution to the problem is thought to be in the development of resistant bee stock, there is an immediate need to avoid economic losses to beekeepers and ensure bees for pollination. This prompted a search for a safe control product.

In the U.S., **menthol** was registered in 1988. Although menthol treatment has been successful in areas with long hot summers where it can be applied when honey is not being produced, the method didn't work well in cooler regions with a short summer. Research at several locations in B.C. in 1989 and 1990, had suggested that careful timing of menthol application might work. Reports of the use of **formic acid** in Europe and laboratory experience with **vegetable oil** suggested that they too might have a beneficial effect.

The B.C. Peace region had traditionally relied on package bees imported from the U.S., so it was the first area in the province to have infested bee colonies. Kerry Clark, Apiculture Specialist with the Ministry in Dawson Creek, designed and carried out a project to test three methods of controlling the mites, using applications of vegetable oil, menthol or formic acid. Van-Han Apiaries at Mile 24 on the Alaska Highway, contributed bee colonies with mites for the test. Funding from the D.A.T.E. program paid for the laboratory examination of the many thousands of bees necessary to measure the effect of the treatments. Dr. Peter Sporns, at the University of Alberta analyzed honey samples to determine the effect of treatment on the honey crop. Other cooperators in the project contributed bee samples from colonies in the southern interior, monitored by Apiculture Specialist John Gates at the Ministry's Vernon office.

Vegetable Oil. Previous work had suggested that newly emerged bees (the usual target for migrating mites) would not become infested if they had come into contact with vegetable oil. This study indicated that the placement into bee hives, of corrugated cardboard squares soaked in canola oil, had little or no effect on the build up of mites. Colonies treated with patties of oil and sugar had a significantly reduced mite population after 2 months; but not enough to avoid winter damage.

Menthol. A treatment "window" for the application of menthol was confirmed, but with some adverse effects. In the Peace region, temperatures by May 15 are warm enough to allow the one-month treatment with menthol crystals, in time for the crystals to be removed before honey production begins about mid June. Occasional hot days during that period, however, may cause the menthol to become repellent to the bees, disrupting their population build up to the honey flow.

Formic Acid. Very encouraging results were obtained with formic acid, a synthetic version of the irritant liquid produced by ants.

Formic acid is both a natural component of plant nectar and is added by bees to nectar during the normal conversion of nectar to honey. Synthetic formic acid is an inexpensive industrial product. It is very volatile, vaporizing in the bee hive, killing a high proportion of the tracheal mites without apparent harm to the bees, then dissipating to normal levels. However, acid at the concentration used for treatment of hives will be harmful if it contacts the skin or eyes of the applicator, so precautions have to be taken.

As a result of these findings and of similar trials in the U.S., proposals for regulatory approval of the use of formic acid against tracheal mites are being submitted. Formic acid treatment is also reported to be effective against an even more serious threat to the bee industry; the varroa mite, which in 3 years has become well distributed and established in the U.S. It was found this year at a few border sites in Eastern Canada.

A detailed technical report of the project is available.

SHEARED CHRISTMAS TREES FROM INTERIOR DOUGLAS FIR NATIVE STANDS

Project Number: 317

Supervision: Richard Hallman; Provincial Christmas Tree Industry Specialist; Creston, B.C.

Cooperators: Kootenay Christmas Tree Association
Albert Holmes; Christmas tree growers and wholesaler; Fort Steele, B.C.

Branch: Agricultural Services

Funding:

D.A.T.E.	1991-92	$4,000
D.A.T.E.	1992-93	$4,050

Objective: To demonstrate methods to produce sheared trees from existing native stand Douglas fir Christmas tree operations currently producing non-sheared trees. To demonstrate the increase and change in forage production during intensive culture of these native stands.

Summary: Eighty percent of the Christmas trees produced in B.C., came from native stands in the interior. A large majority of these trees are not sheared. Consumer preference is for a fuller tree that can only be produced by shearing. Sheared trees from native stands return 2 to 3 times the farm gate price of non-sheared trees. The cost of production is much lower for a sheared tree from a native stand than for a sheared tree of the same species from a plantation.

When native stand areas are cultured the production of forage for use by wildlife and cattle in enhanced. The production of sheared trees is the most intensive form of Christmas tree culture on native stands. The change in quantity and quality of forage will be monitored during and after this project.

Work to date has involved plot identification, tissue and soil analysis and some other preliminary work.

The first fertilization will occur in February and March 1992 and shearing in June, July and August 1992. Fertilizer will be reapplied in the fall of 1992 and spring of 1993. Following the second shearing in the summer of 1993, an evaluation of the grade increase will be conducted.

EVALUATING NEW TECHNOLOGIES FOR DETECTION OF POTATO DISEASES

Project employee, Gerda Bowler collecting potato leaf samples.

Project Number: 318

Supervision: David J. Ormrod, Plant Pathologist
Cloverdale, B.C.

Project Staff: Gerda Bowler, B.C. Coast Vegetable Cooperative Association

Cooperators: Dr. P.J. Ellis and Dr. S.H. DeBoer, Agriculture Canada, Vancouver, B.C.
Dr. D.E. Henderson, E.S. Cropconsult Ltd., Vancouver, B.C.
L.S. MacDonald, B.C. Ministry of Agriculture, Fisheries and Food, Cloverdale B.C.
Dr. K.L. Deahl, U.S. Department of Agriculture, Beltsville, MD.

Branch: Crop Protection

Funding: D.A.T.E. 1991-92 - $4,000

Objectives:

Three unrelated events which occurred in the potato industry in the 1990 crop year, prompted the initiation of a D.A.T.E. sponsored disease survey in 1991.

First, late blight which could not be controlled by Ridomil-MZ (metalaxyl plus mancozeb) occurred in the Cloverdale area. Second, imported commercial potatoes infected with bacterial ring rot were intercepted in numerous retail and wholesale outlets in B.C. Finally, an outbreak of PVY(n) in Prince Edward Island resulted in several carloads of U.S. bound PEI seed potatoes being stranded in the Lower Mainland. As each of these problems presented significant risk to the B.C. industry, it was decided to carry out a survey to determine if the local crop had been affected.

To determine the practicality of using recently developed ELISA technology to screen commercial potato crops for viruses and bacterial ring rot, a survey of 34 fields in the Delta and Cloverdale areas were carried out.

At the same time, late blight samples were collected from 14 fields. They were forwarded to the USDA laboratory in Beltsville for metalaxyl resistance testing.

Summary:

For the virus and bacterial testing, 30 composite samples (10 plants/sample) from each field were tested for five viruses and bacterial ring rot. The overall percentage of infected plants were as follows:

PVX (Potato Virus X)	0.17 - 1.7%
PVS (Potato Virus S)	2.26 - 22.6%
PVY(o) (Potato Virus Y, o strain)	0.80 - 8.0%
PVY(n) (Potato Virus Y, n strain)	0.0 - 0.0%
PLRV (Potato Leafroll Virus)	0.19 - 1.9%
BRR (Bacterial Ring Rot)	0.0 - 0.0%

These results indicate that the most important diseases were at a very low level (PLRV) or absent (PVY(n), BRR) in a random sample representative of approximately 15% of the commercial potato crop in the Fraser Valley.

Twelve of the 34 fields had no detectable viruses at all, a clear reflection of the high quality of Pemberton seed which is the original source of most potatoes planted in the Fraser Valley. The cost of carrying out a survey in this manner for six diseases was estimated at between $175 and $250 per field.

The testing of the late blight collections showed that six out of nine isolates were resistant to metalaxyl. Growers have been advised to follow a program which will minimize the selection pressure which leads to resistant populations.

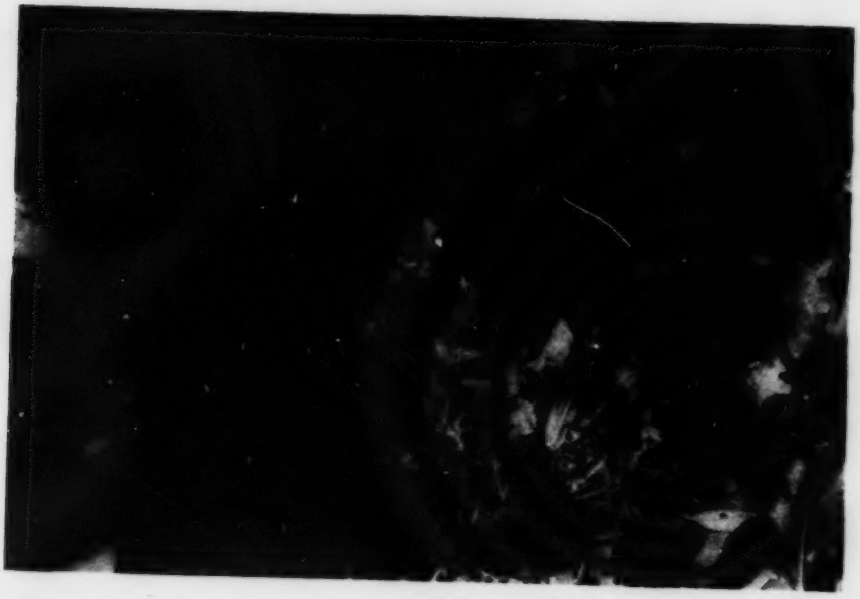
It is intended to repeat the survey in 1992 with the following objectives in mind:

1. To further perfect the ELISA procedure, especially for bacterial ring rot.

2. To determine the cost-effectiveness of carrying out the ELISA testing in the Cloverdale plant diagnostic laboratory in future years.

3. To increase confidence that neither BRR nor PVY(n) is present in commercial potato crops in the Fraser Valley.

ALTERNATIVE FORAGE SPECIES FOR GRAZING LIVESTOCK IN BRITISH COLUMBIA



Forage Star Hybrid Turnip

Project Number: 319

Supervision: Michael Betts, Field Crop Specialist, Sidney, B.C.

Cooperators: Agriculture Canada, Plant Quarantine Station, Sidney, B.C.
Michael Shapiro, Alf Christianson Seed Company, Mt. Vernon, Washington
Volkhardt Fritsche, Waldek Farm, Parksville, B.C.
Edgar Smith, Beavermeadow Farm Ltd., Comox, B.C.
Shirley Gardner and Les Gardner Quesnel, B.C.

Branch: Agriculture Division, South Coastal Region

Funding:

D.A.T.E.	1991-92	$2,500
D.A.T.E.	1992-93	$2,500

Objective: To establish and evaluate forage species with potential, for use in livestock forage grazing management systems. Forage species to be evaluated include four brassica species, chicory and sheep's burnett.

Summary: Varieties of forages being evaluated are described as follows:

Forage Rape, "Sparta" - a clubroot resistant rape which may be spring or fall planted. It is described as having a high leaf to stem ratio and soft palatable stems. In European trials it has outyielded standard varieties by 5 to 10%.

Forage Kale, "Premier" - produces vigorous, stemless plants for higher digestibility and outstanding cold hardiness. Matures 30 to 40 days earlier than traditional forage kale and exhibits rapid regrowth after grazing. May be valuable as a source of winter forage.

Forage Turnip, "Rhondo" - was developed for multiple harvest. Rhondo produces highly palatable forage and is deeply rooted to reduce stock pulling and trampling.

Turnip Hybrid, "Forage Star" - is claimed to have high yields, wide adaptability, superior frost hardiness and good feed conversion. It may be grazed 50 to 60 days after seeding and be regrazed every 30 days thereafter until flowering commences.

Forage Chicory, "Puna" - is a perennial forage herb bred by the New Zealand government. Forage yields of up to 25,000 kilograms of dry matter per hectare have been produced in New Zealand, and has been valuable as a grazing forage for high weight gains in livestock.

Sheep's Burnett (Sanguisorbaninor) - is a deep rooted hardy perennial herb, originating in the Mediterranean region. It is known for its ability to produce palatable feed under dry conditions and in cold temperatures. The plant is quite adaptable and can be an important source of forage on lands that suffer periodic drought stress.

The summer of 1991 was the first year of planting these forages in the south Coastal Region.

Puna chicory was successfully established at Agassiz and Sidney, in four replicate trials. Periodic visual assessment of these plots will continue over the winter. Simulated grazing of chicory will be initiated in the spring of 1992. An on-farm demonstration of both Puna chicory and sheep's burnett seeded in 1991, on Waldek Farm in Parksville, will be evaluated in the spring and summer of 1992.

All brassicas mentioned above, were planted in Quesnel (in co-operation with Peter Fofonoff, Shirley Gardner and Les Gardner) and in Sidney and Comox. Excellent success in establishment was achieved at Sidney and Quesnel. Exceptional seeding vigour of the brassicas resulted in clean plots with low weed populations. In Quesnel where feeder lambs grazed on the brassicas, an average daily gain was 0.80 lbs., per lamb, per day with the highest animal reaching 1.25 lbs., per lamb, per day. Yields of 2.5 tons/acre were achieved on 1st cut material at 12 to 16% protein and 23 to 31% protein on regrowth.

In Sidney, yields of first cut brassicas and an orchardgrass check plot seeded in July/91 were:

	Yield(tons/acre)
Premier kale	1.06
Spartarape	1.28
Rhondo turnip	1.03
Forage Star turnip	1.09
Hallmark orchardgrass	1.06

In Comox, oats seeded two weeks earlier than the brassicas had enough head start to out compete the brassicas.

General Comments: Late season feed value of these brassicas on the Coast has yet to be determined, however, initial indications are that it will be quite high. Generally, brassicas produce high quality feed during late part of the growing season when grasses commonly used may have much lower quality. Future investigation on quality and suitability of the above mentioned species for the South Coast will be conducted in 1992.

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LEGUME PLOWDOWN AS AN ALTERNATIVE TO SUMMERFALLOW

Project Number: 320

Supervision: Kevin Murphy - Field Crops Agrologist, Dawson Creek
Ken Nickel - Field Crops Agrologist, Fort St. John

Cooperators: Allen Watson, Dawson Creek
Abe Unruh, Flatrock

Branch: North Central

Funding: D.A.T.E. 1991-92 - $2,000

Objectives: To compare the benefits/costs of traditional summerfallow and plowdown of three legumes on subsequent wheat yields.

In addition, the yield response of wheat to various rates of nitrogen fertilizer will be evaluated to document the effectiveness of green manured crops as a replacement or supplement for chemical fertilizer.

Summary: The South Peace site was located in Landry, and the North Peace Site was located in Flatrock. Each site contained four, five acre plots. Crops grown included Indianhead lentils, Radley field peas, and clover. The fourth plot was summerfallowed. The clover crops had been seeded in 1990, along with wheat, while the peas and lentils were seeded in later May 1991.

The peas were combined and the crop returns will be considered in the benefit cost analysis conducted at the end of the project in 1992. The stubble from the peas, lentils and clover plots was incorporated using heavy discs.

Both sites were included in summer Field Tours. The South Peace site was part of the Peace River Soil Conservation Association 5th Annual Tour. Eighty-five producers from Alberta and British Columbia attended the tour which included crops seeded with a zero till drill, equipment demonstrations and the legume plowdown demonstration site.

The North Peace site was included in the Flatrock/Golata Creek Conservation Society Tour on July 24, 1991. Fifteen producers were on hand for an equipment demonstration and to view the legume plowdown site.

Soil samples collected from both sites late in October, 1991 were analyzed for nitrate nitrogen. In May, 1992 wheat will be seeded across these plots and nitrogen fertilizer will be banded at four different rates (0, 25, 50, and 75 lbs nitrogen per acre) in order to develop a yield response curve. The effects of each legume crop on subsequent crop yield will also be monitored. Square meter yield samples will be collected from each plot.

Although underseeding clover does not fit in to all producer's crop rotations, the use of peas or lentils as an alternative to summerfallow holds promise. In this instance, the seed is harvested from the legumes prior to incorporation.

GINSENG TECHNOLOGY FACT-FINDING MISSION JAPAN, KOREA, TAIWAN AND HONG KONG

Traditional Ginseng Culture Methods in Japan and Korea

Project Number: 321

Supervision: Al Oliver, Provincial Ginseng Specialist, Kamloops, B.C.

Cooperator: Dr. W.G.(Bill) Bailey, Simon Fraser University

Funding: D.A.T.E. 1991-92 $4,968

Objective: To tour the ginseng growing areas, research stations, manufacturing plants and general market places of Japan, Korea, Taiwan and Hong Kong, to gather transferable technology. The plan is to look specifically at the culture, handling, processing and marketing of ginseng and ginseng products.

Summary: It became apparent early in the tour that the South East Asia Ginseng industry has four distinct sectors, culture, research, value added and marketing.

British Columbia's ginseng industry by comparison has a long way to go in most areas. B.C. does have a good grasp of, the cultural, on farm sector. The trip to Asia did give a good look at where the industry can go, especially in the area of value added products.

The availability of ginseng and ginseng products were like soft drink products are here. They were available in all types of stores, in vending machines and were advertised in many ways, T.V., radio, magazines, billboards, on buses, etc. A fascinating product. One of the most interesting were the ginseng 'specialty' stores where only ginseng products were sold.

Ginseng is used in Asia for three distinct uses, as a herbal tea, a health food product and as a medicinal herb. It was found in a multitude of forms; as whole root, fresh or dry; from powder in capsules to liquid in ampoules and from chewing gum to soft drinks, either as ginseng alone or with other things. It was very popular as a sport drink to quench ones thirst after exercising.

The greatest benefit from this tour could well be in the contacts that were made. In total, the tour met some 70 scientists, medical doctors and businessmen, most of whom spoke English, and were exceptionally open and friendly. Since returning home, contacts have been made with various parties with whom contact was made in Asia.

It became apparent that in Asia the standards are quite high and if B.C. is to succeed with American ginseng in the marketplace, quality is very important. In two countries, Japan and Korea, very little 'American' product was seen as it is very difficult or illegal (in the case of Korea) to import it.

The trip was made much more enjoyable by the able leadership of Dr. W.G. (Bill) Bailey, from Simon Fraser University. He had been in much of the area before and was familiar with the systems.

He also set up the itinerary for the tour, with his prior contacts in Asia. Without this help, much less would have been accomplished. Thanks Bill.

Without the experience of this trip it would be impossible to imagine what was there and how important a commodity ginseng is. It was an experience, well worth the time and expense, that will help to shape this new cash crop in British Columbia, for years to come.

SWEET CHERRY VARIETY TRIAL

Project Number: 322

Supervision: Helmut Arndt, District Horticulturalist, Kelowna, B.C.

Cooperator: Dr. David Lane, Agriculture Canada, Summerland

Funding: D.A.T.E. 1991-92 $2,500

Objective: To evaluate untested and new sweet cherry selections from the Summerland Research Station and other cherry growing regions.

Summary: Six different varieties are ready for planting in the Spring of 1992. Trees were not available for Spring 1991 planting because of winter freeze to nursery stock. A micro-jet irrigation system also will be installed at the time of tree planting. Soil preparation and plot layout were accomplished in the fall of 1991 in anticipation of 1992 planting. Variety evaluation is the main focus of this plot, but there will be enough trees planted to evaluate several tree training and pruning experiments that may be utilized for high density sweet cherry plantings.

TOXIC FORAGE SELENIUM EVALUATION

Project Number: 323

Supervision: Greg Tegart, P.Ag., Vernon District Office

Cooperators: Henry Lange, Animal Health Branch
Bill Hedges, S.I.R. Technician, Kelowna

Branch: Agriculture Program, Southern Interior Region

Funding:

D.A.T.E.	1991-92
allocated -	$12,000
voluntarily reduced to -	$3,000

Objectives: To determine the geographic areas and/or extent of the high selenium soils in the Vernon district, then quantify the levels and characterize the situations where these toxic selenium levels occur. Subsequent to that, determine how forage or other crops can be safely utilized.

Summary: Laboratory and technical assistance was and is being obtained via Dr. Ivan Palmer, of South Dakota State University. Dr. Palmer and the associated laboratory is experienced in assessing high selenium levels in soils and plant tissues.

Unfortunately, other activities this year necessitated a priority adjustment. Determination of selenium levels from the known "toxic" sites and an initial look at two other suspect sites was undertaken. The soil and inventory work was not able to be done. Results from the "toxic" site evaluation are, as yet, unavailable as the lab work is currently underway.

This year's work will greatly assist us in determining how the forage crop on the "toxic" site can be fed. There is still some inventory problem characterization and information extension work to complete.

UTILIZATION OF THE IMMUNOPEROXIDASE TEST FOR THE DIAGNOSIS AND MONITORING OF TGE INFECTION IN B.C. SWINE

Dr. J. Robinson performing the new swine diarrhea virus test

Project Number:	324
Supervision:	Dr. J. Robinson, Provincial Veterinary Virologist, Abbotsford
Cooperator:	Dr. N. Palechek, Swine Extension Specialist
Branch:	Animal Health Branch (Centre)
Funding:	D.A.T.E. 1991 - 92 $2,995
Objective:	To develop technical proficiency with subsequent utilization of the diagnostic Peroxidase test for TGE infections in swine.

Summary:

The Immunoperoxidase Test (IP) for TGE virus in commercial swine is now being utilized at the Animal Health Centre (AHC) virus diagnostive section. The test has proven to be reliable and specific as a virus detection tool for identifying TGE in the cells lining the surface of the small intestine of the affected pig.

During adaptation of the IP test for use at the AHC, a number of technical difficulties arose particularly with obtaining reagents and automating the test to handle large numbers of specimens. Accordingly, a large number of samples have yet to be tested. This backlog will be cleared up and the project will continue throughout 1992 for suspect TGE cases. This will result in approximately 200 plus specimens being tested (based on 1991 submissions). In addition, the test will be used in the minimal disease monitoring herd health program to detect silent carriers of the disease in these special purpose swine operations.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE SOUTHERN INTERIOR REGION

Sheep vegetation management project demonstration use of sheep on forest clear cut sites

Project Number: 325

Supervision: Helmut Arndt, Mike Malmberg, Brian Harper, Greg Tegart, Graham Strachan, John Vielvoye, Al Oliver, Mike Sanders, Ted Moore, Tim Watson, Wray McDonnell, Ted Berry.

Cooperators: Association of B.C. Grape Growers, British Columbia Fruit Growers' Association Test Orchard, Agriculture Canada, Ministry of Forests, individual growers and ranchers.

Funding: D.A.T.E. 1991-92 - $10,000

Objectives: To enhance the adaptation of new technologies in the Southern Interior Region by demonstrating new techniques and by observing, collecting and disseminating relevant information found outside the region.

Summary:

1). **Grape and Wine Forum** - John Vielvoye

Eighty growers attended this two day event, which was designed to increase the awareness of grape growing and wine making, and to transfer knowledge in grape and wine technology to those in the industry.

2). **Peach and Nectarine Training System Trial** - Tim Watson

Four training systems for these crops are being evaluated under this project. First yields were obtained in 1990. The first significant yields were expected in 1991, however, winter injury from December 1991 reduced the crop significantly. Despite winter injury, peaches trained to all four systems exceeded projections for the density. Good yields are expected in 1992.

3). **Saskatoon Berry Variety Trials** - Al Oliver

The objective of this project was to ascertain the potential for commercial production of Saskatoons, for fresh and processing markets in the southern interior of B.C. Thirteen cultivars were planted in two sites in 1990. The trial one site was abandoned due to poor establishment. Very few plants fruited in 1991, but it is anticipated that 1992 could see higher yields.

4). **Sunscald Reduction Trial in Apples** - Helmut Arndt

The objective of this project was to demonstrate the effectiveness of using shade cloth to reduce heat damage (sun scald) caused by high temperatures. Thirty percent shade cloth was hung over Jonagold apples to test reduced damage. Results showed that up to 15% reduced sunburn over non-covered treatments. The project will continue in 1992.

5). **Symposium on Training and Pruning Fruit Trees** - Mike Sanders

This symposium held in Shepherdstown, West Virginia, from July 16 - 20, 1991 was attended by Mike Sanders.

Tree training physiology and pruning was the main focus. Material learned will be used in demonstrating to growers the physiology behind tree pruning and training.

6). **Soil Fertility Workshop** - Ted Berry

A soil fertility workshop for the regional Agriculture Program staff was held in Kamloops, in November 1991. D.A.T.E. funding was used to cover travel expenses of Dr. Ross McKenzie, Soil Fertility Specialist with Alberta Agriculture, Lethbridge. Dr. McKenzie was one of two experts who acted as discussion facilitators for this session.

In addition, the laboratory costs for analysis of soil samples for discussion purposes were covered.

7). **Sheep Vegetation Management Review** - Ted Moore

A survey was undertaken which included travelling to the different vegetation management projects in the province, interviewing those involved in collecting relevant data, and taking part in field days. Guidelines for sheep vegetative management were developed for each of the projects.

8). **Animal Welfare Presentation** - Graham Strachan

A noted animal welfare expert from Britain, Dr. Robert Darroch, was in the Pacific Northwest and the Province in October 1991.

D.A.T.E. funds were utilized to enable Dr. Darroch to travel to the southern interior. Three areas were visited and discussions held between branch personnel, Ministry staff, and industry people in the region.

9). **North Okanagan Dairy Short Course** - Brian Harper, Greg Tegart

Speaker, Dr. Bob Van Saun, a veterinarian and nutritional consultant from Michigan was brought in to give the keynote address. The knowledge and expertise of Dr. Van Saun was well received by North Okanagan dairymen.

10). **The Society for Range Management International Conference** - Mike Malmberg, Bob France

This educational conference held in Spokane, Washington, in February 1992 was attended by Mike Malmberg, District Agriculturist, Cranbrook, and Bob France, Provincial Beef Industry Specialist, along with over 1,500 professionals in the field of range management.

In addition to benefiting from the technical presentations, staff members were seeking speakers for range management seminars planned for British Columbia, particularly in the area of resolving agriculture wildlife conflicts.

11). **The Western Canadian Dairy Seminar** - Brian Harper

This seminar held in Red Deer, Alberta, in March, 1992 was attended by Brian Harper, District Agriculturist, Salmon Arm. Besides exposure to new information in the industry, Brian Harper will be reviewing speakers for possible future short courses in the North Okanagan.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE NORTH CENTRAL REGION

Jim Tingle examining Trapper Peas planted with Condor Barley for Silage

Project Number: 326

Funding: D.A.T.E. 1991-92 $10,000

Objective: To undertake specific projects in the North Central region which are consistent with the terms of reference of the D.A.T.E. Program.

Complete Feed Silage Mixtures

Supervision: Jim Tingle, Forage Industry Specialist, Prince George
Ken McAra, District Agriculturist, Prince George

Cooperators: Bar K Ranch, Prince George
Karin Stever, B.C. Cattlemens Association

Summary: Barley, wheat and oat varieties were sown with either Trapper peas of Hairy vetch to improve protein levels of barley silage traditionally grown on the Bar K Ranch near Prince George. Preservation of a complete feed with 11% CP and 63% TDN could result in savings of $50 per head, per year. Mixtures of Condor barley or Roblin wheat with Trapper peas or of Duke barley with Hairy vetch reached the target of 11% CP. Only the pure stand of Trapper peas at 16% CP and 63% TDN reached the combined target quality. The check barley silage had 8.1% CP and 60% TDN.

Applying Optical Character Recognition Equipment to Extension

Supervision: Ken McAra, District Agrologist,
Prince George

A document scanner and Optical Character Recognition Software was considered to have a wide array of uses including scanning of factsheets already typewritten (instead of retyping) and the inclusion of photographs and illustrations in our regional newsletters and other publications.

In developing a database for extension, ease of entry of data is a primary consideration. It is easy to commit electronically-based information to an electronic database, but it is more difficult to enter printed text and pictures. With this technology it is possible to enter and retrieve data from printed sources electronically. Document scanning hardware and optical character recognition software would appear to have a valuable place in a modern extension office.

Field Demonstration Yield Assessment using a Weigh Wagon

Supervision: Ken Nickel, Field Crops Agrologist,
Fort St. John
Kevin Murphy, Field Crops Agrologist,
Dawson Creek

The ability to obtain quick and accurate crop yield measurements provides farmers with the opportunity to assess new products or production practices on their own farms. A visual assessment is unlikely to detect yield differences of less than 10%. Often, field comparisons are never given more than a visual assessment due to the time and labour required to measure the actual crop yields for each treatment.

A "Weigh Wagon" mounted on the back of a truck, will be used to facilitate and increase the collection of crop yield data by farmers, industry and extension workers. During 1991, the equipment was purchased and assembled and will be ready for use in the 1992 crop year. Field demonstrations that would not have been possible without this equipment, have already been planned.

Forage Brassicas for Late Season Sheep Pasture

Supervision: Peter Fofonoff, Sr. Agrologist, Williams Lake
Shirley Gardner, Extension Technician, Quesnel

Cooperators: Les Gardner and Shirley Gardner, Quesnel

Forage brassicas appeared that they would provide a late season forage with high protein and high digestibility; and that they were well adapted to cool, dry growing conditions. Forage brassacas (Kale Premier, Rape Sparta, Turnip Rondo and Hybrid Turnip Forage Star) were seeded at 4 lbs./ac with a Brillion seeder and fertilized with 75 lbs. N, 70 lbs. P., 100 lbs. K, and 3 lbs. each of Sulfur and Boron. Barley at 40 lbs./ac was overseeded as a companion crop. Twenty-two feeder lambs rotationally grazed the field, being controlled by electric fencing.

The forage brassicas were grazed from July 23 until August 15, 1991. Lambs gained 0.80 lbs./day (average) and as high as 1.25 lbs./day. Average yield of the forage brassicas was 2.5 tons/ac of dry matter with crude protein content of 12-16%.

Crude protein on regrowth was higher (23-31%).

Some specific management considerations were recorded during the trial. All four forage brassicas will be assessed for winter survival and spring grazing value under Cariboo conditions. A trial with forage brassicas for feeder steers will be conducted in 1992.

DEMONSTRATION OF AGRICULTURAL TECHNOLOGY IN THE SOUTH COASTAL REGION

Alf Krause preparing to test operate the insect vaccum in his strawberry field.

Project Number: 327

Supervision:
Don Low, Pork Industry Specialist, Abbotsford
Gordon Grant, Provincial Floriculture Specialist, Abbotsford
Jim Portree, Provincial Greenhouse Vegetable Specialist, Abbotsford
Dave Flood, Greenhouse Technician, Abbotsford
Bill Weismiller, District Agriculturist, Chilliwack
Brent Warner, New Crop Development Specialist, Sidney
Stewart Paulson, Provincial Poultry Specialist, Abbotsford
Merv Wetzstein, health Management Veterinarian, Abbotsford
Bill Peters, Provincial Berry and Nut Specialist, Abbotsford
Bert Van Dalfsen, Mechanization Engineer, Abbotsford

Cooperators: EGC Enterprises, Langley
Larry Fox, M.S., Ph.D., Washington State University, Pullman, Washington
Mike Yusko, Fraser Valley Milk Producers Cooperative Association
Neil Saelman, Buckerfield's
Dr. Brian Upper, Cheam View Veterinary Hospital, Chilliwack
Dave Remlinger, Coronation, Washington
Agriscope Society, Chilliwack
Robert Darroch, Warwick, England
Krause Bros. Farms, Aldergrove
Tom Baumann, Fraser Valley Strawberries Association
Henry Gerber, Crop Protection Branch, Cloverdale

Funding: D.A.T.E. 1991-92 $10,000

Objectives: To undertake specific projects and enhance new technologies in the South Coastal Region in accordance with the terms of reference of the D.A.T.E. program.

Summary: Pork producers in B.C. lose 10-25% of newborn pigs. Almost half the loss is due to crushing. A British farrowing crate demonstration project was introduced as a means to eliminate crushing losses thereby increasing the potential for significant gains in productivity. Results will be entered in a computerized record keeping system and published in various farm tabloids. Technology will be videotaped for presentation to producer groups.

The automated weather station at the Agriculture and Food Centre was upgraded to hold a year's worth of climate and weather data. The upgrade will provide better access and control capabilities for recording the greenhouse and weather systems, manipulating the large volumes of data collected and maintaining the current technology base of clients. Maximum benefit will be derived from the greenhouse facility by continued work on nutrient recycling and waste control, disease transmission studies, IPM in vegetables and ornamentals and the development of new potted and cut flower crops.

Weather data summaries will be distributed to researchers and ministry personnel.

A mastitis seminar was held in the Fraser Valley on November 5 and 6, 1991. Dr. Larry Fox, Associate Professor, FDIU, Washington State University, Pullman, Washington, was the guest speaker. Dr. Fox participated as the workshop leader, discussing physiology, causes and solutions of mastitis with local dairy producers in an effort to lower or eliminate the losses for high somatic cell count producers. Approximately 80 people attended each seminar.

A Farm Marketing seminar was held on November 12, 1991 in Chilliwack. The Ministry in cooperation with the Chilliwack Agriscope Society, presented the seminar for local farmers. Mr. Dave Remlinger, a successful Washington State marketer, presented information on building and developing marketing skills and strategies to sell direct and increase farm revenues.

An additional data pod and humidity sensors were purchased for the Integrated Pest Management Project on Vancouver Island. This will enable contracted growers to have their potato and carrot fields monitored on a weekly basis allowing the increased use of IPM. Results will be analyzed and summarized for the industry. The net results should be lower for the industry. The net results should be lower crop losses due to insects, a higher quality product and net returns to growers.

Mr. Robert Darroch, National Livestock Training Advisor, England, presented an evaluation of farm animal welfare issues in the beef, dairy and swine industries. Production methods used by B.C. producer's were compared to British procedures. Emphasis was placed upon legislative developments and the effects upon livestock producers.

An insect vacuum for strawberries was purchased for testing on a producer's field. In an effort to reduce pesticide use in the control of lygus bugs, an environmentally friendly pest control system has been introduced.

These bugs are a problem affecting B.C.'s $10 million strawberry industry. This is the first insect vacuum used in B.C. and field days will be held to demonstrate equipment. Results will be evaluated and presented at grower's courses and meetings throughout the province.

B.C. CHRISTMAS TREE RETAILER SEMINAR

Project Number: 328

Supervision: Richard Hallman; Provincial Christmas Tree Industry Specialist; Creston, B.C.

Cooperators: Southwest B.C. Christmas Tree Association
Donna Anaka; Retail Development Officer; Cloverdale, B.C.
Sally Abbott; Extension Systems Branch; Kelowna, B.C.

Branch: Agriculture Services

Funding:

D.A.T.E.	1991-92	$1,000
Southwest B.C. Christmas Tree Association		$1,500

Extension Systems Branch - Cost of video taping, editing and tape reproduction

Objectives: To provide up-to-date retail marketing and post harvest handling information to growers, wholesalers and retailers of B.C. grown Christmas trees. To produce video tapes of the workshop for use through the province.

Summary: Improvement in the retailing of Christmas trees is critical to the future growth, development and survivability of this industry in B.C. Poor handling of trees after harvest, a low level of understanding of how to preserve tree quality and maintain freshness and poor communication of the core information from retailers to consumers are significant problems that are contributing to loss of market share.

If B.C.'s Christmas tree industry is to regain lost market share, the quality of B.C. grown trees must be improved. A high quality tree, promoted as B.C. grown, can be sold at a premium over imported trees.

The seminar was held on October 5, 1991. Sixty-five growers and retailers attended from all over the province.

Speakers were:

Donna Anaka, Retail Development Officer; B.C. Ministry of Agriculture, Fisheries and Food

Betty Malone, Christmas tree grower and retailer; retailer representative to the American National Christmas Tree Association Board, Oregon

Dr. Gary Chastagner, Research Scientist; Washington State University. (Field of research is Christmas tree post harvest handling and Christmas tree diseases).

Brian Minter, Retail garden center owner, and syndicated radio and television columnist; Chilliwack, B.C.

Richard Hallman, Provincial Christmas Tree Industry Specialist;
B.C. Ministry of Agriculture, Fisheries and Food

The seminar was very successful and all the original goals were met.

The videos put together by the Extension Systems Branch will be used at grower meetings and loaned out to individuals from Ministry offices and the associations. Growers will be able to purchase a set for themselves from the video contractor. The availability of the video is being advertised in the provincial Christmas tree newsletter.

HONEYBEE NUCLEUS STUDIES

James Macdonald breaking nucleus hives from full size honey-bee colonies.

Project Number: 329

Supervision: John Gates, Apiculture Specialist, Vernon

Project Staff: James Macdonald, Contractor

Cooperators:
B.C. Bee Breeders' Association
Terry's Honey Farm
Tegart Apiaries

Branch: Crop Protection, Apiculture Program

Funding:

D.A.T.E.	1991 - 92	$4,913
D.A.T.E.	1992 - 93	$5,285
B.C.B.B.A.	1991 - 92	$ 200
B.C.B.B.A.	1992 - 93	$ 200
Terry's Honey Farm	1991 - 92	$ 200
Tegart Apiaries	1992 - 93	$ 700

Objectives:
1. To investigate two systems of nucleus colony (starter colony) production.

2. To compare nucleus colony honey production to that of full-size colonies.

3. To provide cost of production information for the nucleus systems.

4. To provide an economic analysis comparing the cost of operating nucleus hives to that of full-size hives.

Summary: Nucleus colonies are miniature colonies of bees. Beekeepers producing their own nuclei to overwinter would have control of the genetic characteristics of their stock and have a reliable supply of colonies to replace old, full-size colonies that do not survive the winter. Nuclei should cost less to overwinter than full-size colonies, may be as productive the following season and should be less costly to manage. Nucleus colonies could be a valuable source of income for beekeepers. Also, routine replacement of old honeybee colonies with nuclei will help to control infestations of the Honeybee Tracheal Mite.

Standard beekeeping equipment was modified to house the nuclei in their development stages and to protect the small colonies over winter. A prototype styrofoam-insulated box which was to be tested for overwintering, was not available from the cooperator due to design problems. We hope to be able to test the new model over the winter of 1992-93.

Two methods of nucleus colony production were tested in July/91. Time studies proved that one system was much easier and faster to use. Queen cells, rather than mated queens, were introduced to the nuclei.

A second batch of nuclei was produced in August, using the preferred technique in July. At the same time, new queens were introduced into one-half of the old full-size colonies in the test.

Queen production, colony development and costs of production were recorded.

All large and small colonies were fed as necessary in October, then weighed before being prepared for winter. Before they are fed in the spring, they will be weighed again to determine winter honey consumption values. During the winter months, a thermograph will constantly monitor ambient air temperatures in the bee yard.

In 1992, nucleus and full-size colonies will be compared for winter survival, honey consumption, colony development, costs of management and productivity. Nucleus colony production will be refined, based on our findings and a new round of nuclei will be produced to overwinter in 1992-93.

INTRODUCTION OF NEW GRAPE CULTIVARS

Project Number: 330

Supervision John Vielvoye, Provincial Grape Industry Specialist, Kelowna, B.C.

Cooperators: Domaine de Chaberton - Estate Winery
Wayne and Helen Ulrich - Ag Canada, Quarantine
Morisson-Conderc - French grape nursery

Branch: Agriculture Division, Southern Interior Region

Funding: D.A.T.E. 1991-92, $3,000.00

Objective: Propagate 25 new grape cultivars. Introduce these two to sites representing the Vancouver Island and Fraser Valley appellations. Evaluate these 25 cultivars together with Chardonnay Clone 96 grafted to 3 different rootstocks tolerant to low pH soils; evaluate horticultural performance and assess wine potential.

Summary: This project received funding late in the 1991-92 fiscal year. Propagation has started and vines from France are en route at the writing of this report.

Propagation will be completed in 1992. Imported vines will be planted early in 1992. Locally propagated vines will be planted late 1992/early 1993. This project will continue for approximately 10 years. Costs to be borne by the cooperators. Direction to be provided by the project supervisor. Interim reports will be issued once the vineyards reach maturity. Newsletters and field days will be held at each site periodically.

In addition to introducing new cultivars to the two appellation areas, the project will evaluate a new trellis design. These plantings will become a local source of fully virus indexed propagation material.

HUMAN RESOURCE MANAGEMENT

Project Number: 331

Supervision: Lorne Owen, Provincial Farm Management Specialist, Farm Management branch, Abbotsford

Funding: D.A.T.E. 1991-92 $1,860

Objective: Attend the Farm Personnel Management Workshop, sponsored by the University of California, Berkely, to acquire the latest information on human resource management for B.C. Growers.

Summary: U.S. farm managers are dealing with many of the same personnel problems as B.C. farm managers. American university and extension staff are developing an inventory of research and education materials that would benefit our producers. This includes research reports, papers, newsletters, and videos.

A regional committee is being formed (California, Oregon, Washington, etc.) and B.C. has been invited to participate in it. This would provide B.C. farmers with the opportunity to efficiently acquire the best of material available on farm labour management and avoid duplicating efforts.

The B.C. Farm Employers Handbook was handed out at this workshop as an example of how research materials can be developed for farm managers. The U.S.D.A., will be distributing copies of this handbook to 100 labour management specialists across the U.S., as part of the conference proceedings.

One observation is the increase in labour regulations that U.S. managers are faced with. It is likely that there is a big variance between expectations and compliance.

Our approach in Canada - a strong emphasis on industry self-regulation will be much better, if it can stay on track, if not producers will end up burdened with imposed regulations.

It is recommended that Canadian Farm Management Specialists work together with American Extension and University staff, to develop and improve Human Resource Management, extension and training materials, and that Canadians participate in their Regional Farm Personnel Management Committee activities. One possibility for a joint project would be the preparation of a human resource management video.

This workshop provided several ideas that can be incorporated into the B.C. Farm Employers Handbook. This includes a better farm employee evaluation sample form, additional information discipline procedures, information on ethnic diversity in the work place, and some information on how to deal with alcohol and substance abuse.

This publication was produced by:

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